

ABSTRACT OF THE DISCLOSURE

A main object of the present invention is to provide a liquid crystal device element of frequency modulation mode enabling control of on and off of an electro-optical response at high speed by switching the frequency of applied electric field and further, capable of changing a frequency modulation range freely from several Hz to few score kHz or more. The present invention attains the above mentioned object by providing a liquid crystal device element comprising a pair of parallel substrates; conductive layers provided respectively on facing inner surfaces of these substrates; liquid crystal alignment layers provided respectively with pre-tilt angle on facing inner surfaces of these conductive layers; and a liquid crystal layer formed in between these pair of liquid crystal alignment layers, wherein liquid crystal-soluble particles, comprising a core composed of nanoparticles and a liquid crystal molecules or liquid crystal-like molecules provided on its periphery, are dissolved or dispersed in the above mentioned liquid crystal layer, and a control circuit of applying voltage while modulating at least frequency among frequency and voltage is provided on the conductive layer for varying light transmittance of the liquid crystal layer, and under a constant applied voltage, an electro-optical response as a light modulating device element is turned on by switching the frequency of applied electric field from low frequency to high frequency, and the electro-optical response is turned off by switching the frequency from high frequency to low frequency. Under this state, an electro-optical

response can be varied also by varying voltage, and this is a high speed response having a time constant of several ms or less.